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CASE REPORT

Traumatic Pneumatocele

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Traumatic pneumatocele is a rare complication of blunt chest trauma with uncertain pathogenesis. It occurs primarily in pediatric patients and is characterized by single or multiple pulmonary cystic lesions concomitant with other type of injuries of the lung parenchyma. Herein we present a case of traumatic pneumatocele in a 3-year-old boy, together with a brief review of the literature. This rare entity should be considered in the differential diagnosis of cystic lesions complicating blunt chest trauma, especially in young adults. The disease generally has a benign and self-limiting course.

1. Introduction

Traumatic pneumatocele, which has also been reported as traumatic pulmonary pseudocyst or traumatic lung cyst, is a rare complication of blunt chest trauma. It represents air trapped within a pulmonary laceration.[1–3] It generally appears on radiographs as a thin-walled, air-filled cavity, with or without air-fluid levels. Pneumothorax or pneumomediastinum might also coexist. Any number of pneumatoceles can exist at any location, except at the apices.[4] It is an acutely formed primary structure that can prompt unnecessary invasive diagnostic procedures in the emergency room, such as thoracotomy or bronchoscopy, in patients who have sustained closed chest trauma.[5] It is very important for emergency physicians and pediatricians to be familiar with this condition because it generally represents a benign, self-limited condition that only requires observation. A few cases, however, can be associated with life-threatening hemoptysis and secondary infection.

2. Case Report

A 3 year-old boy fell from a motorcycle and hit the right side of his body against the road. He was sent to our emergency department within 1 hour, with clear consciousness. On physical examination, he was hemodynamically stable except for mild tachypnea. There were several bruises over the right side costal margin and abdominal wall. His abdomen was soft without tenderness. His extremities were also freely movable. His breath sounds revealed mild expiratory wheezing over the right side. Blood and biochemistry tests showed an elevated leukocyte count of 172×10^9/L and an abnormal liver function test

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(aspartate transaminase/alanine aminotransferase: 178/108 U/L). A chest radiograph showed heterogeneous consolidation in the right lung with several thin-walled cystic lesions (Figure 1). Chest computed tomography (CT) revealed focal areas of consolidation and several cavities over the posterior segment of the right upper lobes and left lower lobes (Figure 2). There was air-fluid level in the largest cavity and minimal pneumothorax. Traumatic pneumatocele was considered, and the patient was admitted to a pediatric ward. He was treated by observation and wound care. His condition was relatively stable and subsequently improved. He was discharged 1 week later and a follow-up chest radiograph 2 weeks later showed spontaneous resolution of the pneumatocele (Figure 3).

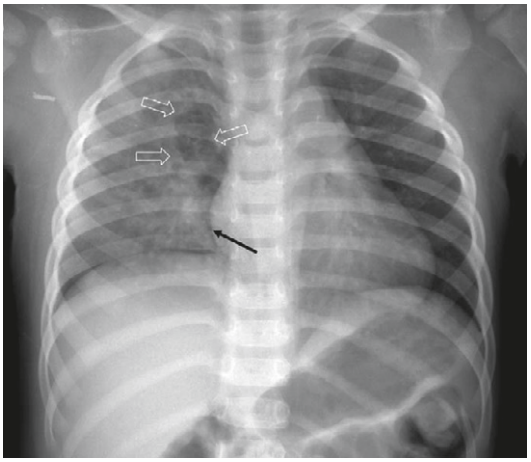

Figure 1 Chest radiograph taken immediately after the injury. Patchy infiltrations and multiple radiolucent, cystic lesions were seen over the right lung (white hollow arrows). Minimal pneumothroax was also noted (bold arrow).

3. Discussion

Traumatic pneumatocele occurs primarily in children and young adults. A review of the literature revealed that 85% of patients were younger than 30 years,[6] and one series[7] from Greece reported that all 14 patients were less than 25 years old. It is postulated that young adults and children have a more compressible bony thorax than adults, and force applied to the chest wall is more easily transferred to the lungs. Although the exact pathogenesis is uncertain, the impact force transfers energy via the compressible thoracic skeleton, which would then directly or indirectly injure the lung parenchyma.[8]

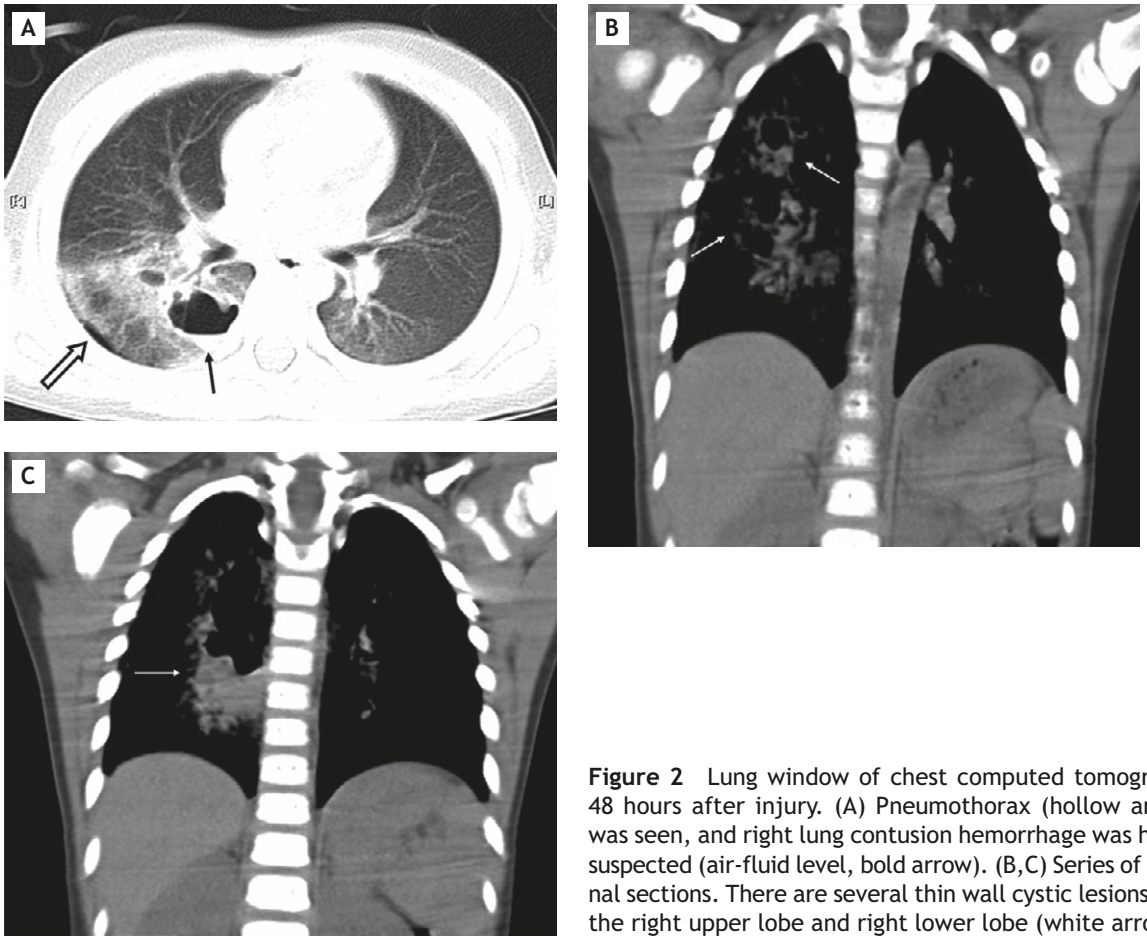

Figure 2 Lung window of chest computed tomography 48 hours after injury. (A) Pneumothorax (hollow arrow) was seen, and right lung contusion hemorrhage was highly suspected (air-fluid level, bold arrow). (B,C) Series of coronal sections. There are several thin wall cystic lesions over the right upper lobe and right lower lobe (white arrows).

Three mechanisms have been suggested to explain the air cyst: (1) physical forces rupturing the alveolar tissue with the elastic lung parenchyma causing a spherical cystic lesion by recoil; (2) compression of the peripheral bronchial tree by transmitted forces, resulting in a sudden rise of pressure in the distal alveoli causing rupture of their walls; and (3) shearing forces produced by concussion waves that tear the lung parenchyma.[9]

Traumatic pneumatocele is rare compared to other complications of blunt chest trauma. A tertiary center in Milan, Italy reported only 10 cases over 9 years.[10] Traumatic pneumatocele is usually caused either by non-penetrating chest trauma, mostly as a result of car accidents, or by continuous positive airway pressure during mechanical ventilation. Swank and Wolfso[11] reported a rare case in 1977 caused by a revolving restaurant. To the best of our knowledge, the youngest patient was 17 days old, with traumatic pneumatocele caused by sustained positive ventilation.[12]

The symptoms are often initially subtle and nonspecific. Chest pain, coughing and dyspnea may be noted within the first few days. Tinges of blood in expectorated sputum might be the first sign, but gross hemoptysis rarely occurs. Patients might suffer from mild fever and leukocytosis as a result of absorption of the damaged lung tissue or blood clot, and this should not be misinterpreted as superimposed infection.[1,13]

Imaging findings may reveal single or multiple lung cysts located in single or multilobular areas, though the lung apices are usually spared.[5] Patchy infiltrates of lung contusion and oval densities of hematoma may also be present. The imaging findings of traumatic pneumatocele should be differentiated from possible preexisting lesions, such as congenital cysts, post-pneumonia pneumatocele, tuberculosis infection, pulmonary abscess, or cavitating pulmonary carcinoma.[1] In the current case, there was no history of severe pneumonia, or respiratory symptoms prior to the accident. Ongoing pneumonia with cavitations or pulmonary abscess was ruled out. None of his resident family members were carriers of tuberculosis. The chest trauma was located over the right side, which corresponded to the location of the pneumatoceles. No previous chest radiographs had been taken in any medical facilities. If pre-injury images are not available, careful history taking and physical examination should be sufficient. In cases of blunt chest trauma, CT is more sensitive than radiography for the detection of pulmonary laceration and pneumothorax.[14] CT is therefore suggested in patients with sustained atypical presentation of traumatic pneumatocele.

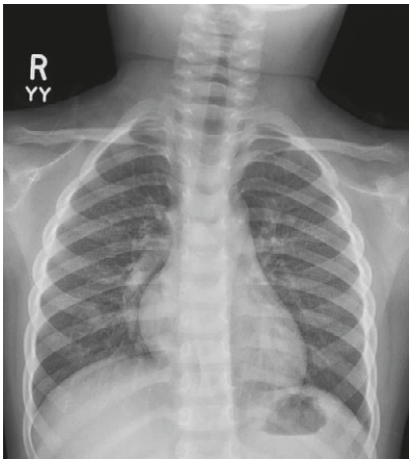

Figure 3 Chest radiograph 2 weeks after injury. The pneumatocele and pneumothorax had completely resolved.

Observation is the only treatment required if the patient has no other complications associated with the trauma. Prophylactic antibiotic usage is still controversial, but is not necessary in most circumstances. The contusion lesions resolve within a few days, but pneumatoceles require longer periods, ranging from several weeks to months on chest films.[15] Most pneumatoceles resolve completely within weeks to months, with no long-term sequelae; however, some persist and regular follow-up is appropriate until fully resolution is demonstrated.[16] In our case, the pneumatocele was resolved within 2 weeks, as shown by the follow-up radiograph (Figure 3).

The prevalence of non-penetrating chest trauma is common in areas where motorcycles are a major form of transport. It is therefore important that all emergency physicians and pediatricians should be familiar with the diagnosis and management of traumatic pneumatocele. The treatment is usually conservative, and the role of prophylatic antibiotics is unclear. Surgical intervention is recommended only when complications such as infections and life-threatening conditions occur. Improved awareness of the disease should help to avoid the use of invasive and unnecessary diagnostic procedures.

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